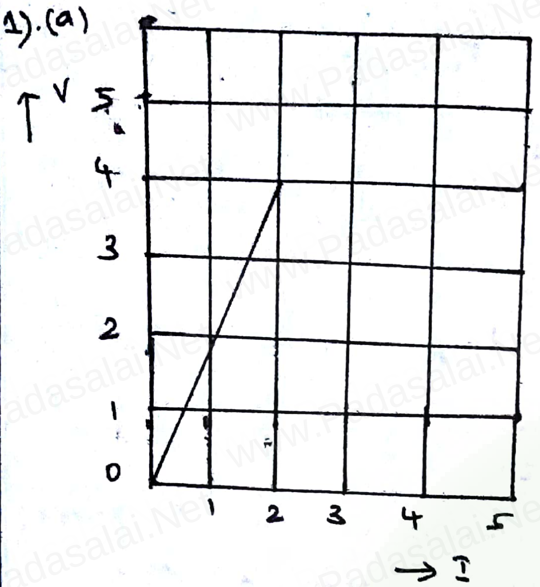
1R

UNIT - 2 CURRENT ELECTRICITY

ONE MARK QUESTIONS SOLUTION (BOOK BACK)

(For Questions Refer the book)

1). (a)

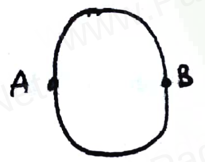


Slope $= \frac{\Delta V}{\Delta I} = R = \frac{4-0}{2-0} = \frac{4}{2} = 2\,ohm$

$\boxed{\text{Ans: 2 ohm}}$

2) a)

$a = 1m$; $R/l = 2\,ohms$



Circumference of the coil $= 2\pi a = 2\pi \times 1$

$= 2\pi$ metre

Resistance per unit length $= 2$ ohms

Resistance through the circumference of the wire (R) $= 2 \times 2\pi$

$= 4\pi$ metre

Resistance at each section (for hemicircle) $= R' = R/2$

$R' = \frac{4\pi}{2} = 2\pi$ ohms.

resistance b/w two points A and B (Parallel combination)

$$R_p = \frac{R_1 R_2}{R_1 + R_2} = \frac{2\pi \times 2\pi}{2\pi + 2\pi}$$

$$= \frac{4\pi^2}{4\pi}$$

$\boxed{R_p = \pi\ ohm.}$

3) (c)

$V = 240V$; $R = 120\Omega$

$P = ?$

$$P = \frac{V^2}{R} = \frac{240 \times 240}{120}$$

$\boxed{P = 480\,W}$

4) b)

$(47 \pm 4.7)\,k\Omega$ $(k = 10^3)$

$= (47000 \pm 4.7 \times 10^3)\,\Omega$

$= (47000 \pm 4700)\,\Omega$

$= (47000 \pm 10\%)\,\Omega$

$= (47 \times 10^3 \pm 10\%)\,\Omega$

color:

4 ⇒ yellow

7 ⇒ violet

10^3 ⇒ 3 → orange

10% ⇒ silver

⇒ Yellow - Violet - Orange - Silver.

5) a)

Brown → 1

Black → 0

Yellow ⇒ 4 ⇒ 10^4

value $= 10 \times 10^4$

$\boxed{R = 100\,k\Omega}$

6) c)

$l_1 = l_2 = l$

Same material $P_1 = P_2 = P$

$R_A = 3R_B$; $r_A / r_B = ?$

Same material

$$P_1 = P_2$$

$$\frac{R_A A}{l} = \frac{R_B A}{l}$$

$$R_A \pi r_A^2 = R_B \pi r_B^2$$

$$\frac{r_A^2}{r_B^2} = \frac{R_B}{R_A} = \frac{R_B}{3R_B}$$

$$\frac{r_A^2}{r_B^2} = \frac{1}{3}$$

$$\boxed{\frac{r_A}{r_B} = \left(\frac{1}{3}\right)^{1/2} = \frac{1}{\sqrt{3}}}$$

7) d)

$V = 230V$

Power dissipation $P_1 = \frac{V^2}{R_1} = \frac{V^2}{R}$

If the wire cut into two equal pieces then resistance will be halved.

So the resistance of wire 1 $= R/2$

" wire 2 $= R/2$

Then two wire is connected Parallel with same power supply (230V)

$$R_p = \frac{R_1 R_2}{R_1 + R_2} = \frac{R/2 \times R/2}{R/2 + R/2}$$

$$= \frac{R^2/4}{2R/2}$$

$$\boxed{R_p = R/4 \text{ ohm}}$$

Power dissipation

$$P_2 = \frac{V^2}{R_p} = \frac{V^2}{R/4}$$

$$P_2 = \frac{4V^2}{R}$$

ratio

$$\frac{P_2}{P_1} = \frac{4V^2}{R} \times \frac{R}{V^2}$$

$$\boxed{P_2/P_1 = 4}$$

8) (C)

In India and USA the Power of the bulb is ~~using~~ same (given)

$V_1 = 220V$ (India)

$P_1 = 60W$

$R_1 = R$

$V_2 = 110V$ (USA)

$P_2 = 60W$

$R_2 = ?$

$$P_1 = P_2$$

$$\frac{V_1^2}{R_1} = \frac{V_2^2}{R_2}$$

$$R_2 = \frac{V_2^2}{V_1^2} \times R_1$$

$$= \frac{110 \times 110}{220 \times 220} \times R$$

$$\boxed{R_2 = \frac{R}{4}}$$

9) d)

Total Power $P = (n_1 P_1) + (n_2 P_2) + (n_3 P_3) + (n_4 P_4)$

$= (15 \times 40) + (5 \times 100) + (5 \times 80) + (1 \times 1000)$

$= 600 + 500 + 400 + 1000$

$P = 2500W$

$V = 220V$

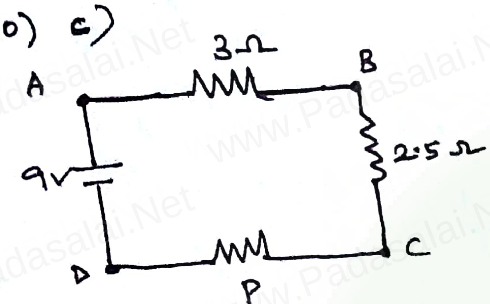
$P = VI$

$I = P/V = \frac{2500}{220}$

$I = 11.3$

$\boxed{I \simeq 12A}$

10) c)



Applying Kirchoff's 2nd law for a closed loop ABCDA

$3I + 2.5I + PI = 9$

$5.5I + PI = 9$

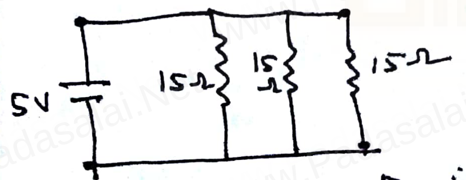
$(5.5 + P) I = 9$ $[I = 1A]$

$5.5 + P = 9$

$P = 9 - 5.5$

$\boxed{P = 3.5\Omega}$

11) a)



Resistors are connected with Power Supply in Parallel combination

$\frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

$= 1/15 + 1/15 + 1/15$

$1/R_P = 3/15$

$R_P = 15/3 = 5\Omega$

$V = IR_P$

$I = V/R_P = \frac{5}{5}$

$\boxed{I = 1A}$

12) d)

$\alpha = 0.00125 / °C$

$t_1 = 300K = 27°C$

$t_2 = ?$

$R_{t_1} = 1\Omega$; $R_{t_2} = 2\Omega$

$R_{t_1} = R_0(1 + \alpha t_1)$

$R_{t_2} = R_0(1 + \alpha t_2)$

$\frac{R_{t_2}}{R_{t_1}} = \frac{2}{1} = \frac{1 + \alpha t_2}{1 + \alpha t_1}$

$2(1 + \alpha t_1) = 1 + \alpha t_2$

$2 + 2\alpha t_1 = 1 + \alpha t_2$

$\alpha t_2 - 2\alpha t_1 = 1$

$\alpha(t_2 - 2t_1) = 1$

$t_2 - 2t_1 = \frac{1}{\alpha}$

$t_2 = \frac{1}{\alpha} + 2t_1$

$= \frac{1}{0.00125} + 2(27)$

$= \frac{10^5}{125} + 54$

$= 800 + 54$

$t_2 = 854°C$

$t_2 = 854 + 273$

$\boxed{t_2 = 1127K}$

13) b)

$\xi = 2.1V$; $I = 0.2A$; $R = 10\Omega$

$V = IR = 0.2 \times 10 = 2V$

$r = \left(\frac{\xi - V}{V}\right)R = \left(\frac{2.1 - 2}{2}\right)10 = 0.5\Omega$

14) d)

[redacted] * Copper has positive temperature ~~of~~ co efficient of resistance

So, resistance decreases with decrease in temperature.

* Germanium has negative temperature co-efficient of resistance.

So, resistance increases with decrease in temperature.

For room temperature to 80 K The resistance of copper decreases and of germanium increases.

15)

For given current (I) ~~of~~ and time (t) the heat is directly proportional to square of current

$H \propto I^2$

So the graph will be straight line.